

Prevalence of Temporomandibular Disorders Among Telemarketers: A Cross-Sectional Study on Occupational Factors

ABSTRACT

Purpose: This study aimed to describe the prevalence of temporomandibular dysfunction (TMD) among telemarketers and identify factors associated with its occurrence, particularly those related to occupational conditions. **Methods:** A cross-sectional study was conducted with 200 telemarketers from a call center, utilizing interviews and physical examinations. Clinical, socio-demographic, occupational, and psychosocial aspects, including the Job content Questionnaire (JCQ) and the General Health Questionnaire (GHQ-12), were assessed. Signs, symptoms, and severity of TMD were determined using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) scale and the Temporomandibular Index (TMI), respectively. Descriptive analysis was performed, and odds ratios (OR) were calculated using unconditional logistic regression, with a 95% confidence interval (CI) as the criterion for identifying the associations. **Results:** The prevalence of TMD among telemarketers was 40.50%, with low severity (IMR=0.08±0.02). Positive associations were found between TMD and length of service exceeding seven months (adjusted OR= 2.0; 95% CI: 1.1- 4.0), an average of more than 82 calls per day (adjusted OR= 2.1; 95% CI: 1.1- 3.9), and a high-stress level (adjusted OR= 2.1; 95% CI: 1.1- 4.4). **Conclusions:** The findings suggest an association between TMD and occupational factors such as prolonged job tenure, high daily call volume, and elevated stress levels in the studied population.

Keywords: Temporomandibular dysfunction; TMD; Telemarketing; Occupational Health; Call center

INTRODUCTION

Disorders involving chronic orofacial pain are widespread in the general population, with temporomandibular dysfunction (TMD) being the most prevalent. In 1999, the American Academy of Orofacial Pain [1] defined TMD as “a collective term covering a wide range of clinical problems involving the masticatory muscles, the temporomandibular joints (TMJ) and their associated structures or all of these elements.” The pain associated with TMD may originate from the joint or muscle, with masticatory muscle pain (MMP) being the most common type [2].

Repetitive movements of the temporomandibular joint without adequate rest are considered to cause functional overload, which, when combined with stress, can trigger TMD [3]. Such conditions are often observed in telework, characterized by prolonged, repetitive TMJ use without sufficient breaks coupled with constant stress [4-6].

Telework, or teleservice, involves providing customer information primarily through voice communication, supported by information and communication technologies. This activity is performed in call centers, which are structured as workstations equipped with computers and telephones [6]. In Brazil, there are over 2,000 call centers, including 250 outsourced facilities, employing more than one million workers nationwide, according to the Brazilian Teleservices Association (ABT) [7].

However, teleworkers frequently report unfavorable working conditions, including strict productivity requirements and rigid time controls. These conditions pose significant public health concerns, as several studies have documented a high prevalence of complaints among call center workers, including anxiety [6-11], stress, fatigue [12], visual and auditory issues [6], and musculoskeletal disorders [4,6,13,14]. A survey by the National Institute of Social Security (INSS), conducted at the request of the Superintendence of Labor and Employment (SRTE), revealed that 45% of absenteeism among teleworkers is due to musculoskeletal disorders [6].

Despite the broad range of health impacts associated with telework, TMD remains an underexplored issue in this population. This study aims to address this gap by identifying the prevalence of TMD and the factors associated with its occurrence among teleworkers, particularly those related to occupational conditions.

MATERIALS AND METHODS

Study Design

This cross-sectional, exploratory study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [15]. It was performed with telemarketers at a telemarketing company, in Salvador, Bahia, Brazil.

Sample Characterization

A convenience sample was drawn from a call center, with 400 individuals aged 18–49 initially recruited. Of these, 200 met the eligibility criteria.

Eligibility Criteria

All call center agents were invited to participate voluntarily. Exclusion criteria included a history of facial trauma, systemic diseases, or previous temporomandibular joint surgery.

Evaluations

Primary data collection occurred from August to October 2007, following extensive communication to ensure participant awareness. Assessments included a structured questionnaire and a physical examination.

Questionnaire

The questionnaire contained six thematic sections:

- 1) Socio-Demographic Data: Age, sex, skin color (as per IBGE criteria), marital status, educational level (high school, incomplete/complete college), and family income (in minimum wages).
- 2) Clinical Aspects: Signs and symptoms of TMD, such as pain, clicking, jaw movement incoordination, and reduced range of motion.
- 3) Occupational Aspects: Length of service (in months), average daily call volume, and average service time (in minutes).
- 4) Psychosocial Aspects: Job demand-control categories, classifying individuals based on workplace demands.
- 5) Minor Mental Disorders: Assessed using the Self-Report Questionnaire (SRQ-20), with ≥ 7 positive responses indicating potential mental disorders.
- 6) Mental Stress: Measured via SRQ-20, categorizing stress as low (below average) or high (above average), based on established cutoff values [17].

Physical Examination

The physical examination and TMD diagnosis were conducted following the RDC/TMD Axis I protocol [16]. Intra-examiner reliability for RDC/TMD application was assessed by re-examining 10% of the sample. Palpation pressure was standardized using an electronic scale, and pachymetry measurements were obtained with a Digimess digital pachymeter.

Statistical analysis

Descriptive analyses were conducted to calculate frequencies for categorical variables and measures of central tendency and dispersion for continuous variables. Intra-examiner reliability for TMD diagnosis and severity was assessed using the Kappa statistic.

The prevalence of TMD was analyzed across variables of interest, with differences between categories evaluated using the Chi-square test. Crude associations between TMD and predictor variables were estimated using Prevalence Ratios (PR) and 95% Confidence Intervals via the Mantel-Haenszel Method. Variables with p-values ≤ 0.05 were included in multivariate analysis using non-conditional logistic regression.

All statistical analyses were performed using Epi-Info version 6.03 [18] and SPSS version 25.

RESULTS

A total of 200 telemarketers were enrolled in this study (Figure 1). At baseline, 40.50% (n=81) were diagnosed with TMD, with 88.89% of these cases classified as masticatory muscle pain (MMP). TMD was more prevalent among women (44.22%), separated/divorced individuals (50.00%), Black participants (44.23%), and those aged over 24 years (41.75%). Participants ranged in age from 18 to 49 years (mean \pm SD: 24 \pm 4.6). TMD was also more common among individuals with a university degree (52.78%) and family incomes ranging from 1 to 3 minimum wages (14.50%) (Table 1).

Occupational Characteristics

According to occupational data (Table 2), telemarketers with TMD had predominantly worked in this activity for over seven months (51.79%), handled more than 82 calls per day (54.88%), and had an average service time (AST) of less than three minutes per call (50.00%). Higher TMD prevalence was also observed among participants who perceived their job as stressful (44.85%), classified their work as high demand (47.37%), and described it as high control (47.37%).

Severity of TMD

The severity of TMD was assessed using the functional index (FI: 0.08 ± 0.52), muscular index (MI: 0.10 ± 0.02), and articular index (AI: 0.06 ± 0.13), with the total temporomandibular index (TMI) recorded as 0.08 ± 0.02 (Table 3). Intra-examiner reliability for TMD diagnosis and severity was excellent, with a Kappa index of 0.93 (95% CI: 0.86-1.00).

Crude Associations

Crude associations TMD and variables of interest were examined. Gender (PR=1.2, 95% CI=1.0-1.4), length of service (PR=1.6, 95% CI=1.3-2.5), average number of calls per day (PR=1.8, 95% CI=1.3-2.5), and stress level (PR=2.1, 95% CI=1.2-3.6) were all significantly associated with TMD and selected for modeling (Table 4).

Multivariate Analysis

In the multivariate analysis, after simultaneous adjustment, the following variables remained significantly associated with TMD:

- **Length of service over seven months** (OR=2.0, 95% CI=1.1–4.0, $p=0.03$),
- **Average number of calls above 81 per day** (OR=2.1, 95% CI=1.1–3.9, $p=0.02$),
- **High stress level** (OR=2.1, 95% CI=1.1–4.4, $p=0.05$).

While gender was positively associated with TMD, the association was not statistically significant in the adjusted model (Table 5).

DISCUSSION

This study aimed to identify the prevalence of TMD among telemarketers and examine the factors associated with its occurrence, particularly occupational factors. The findings revealed that TMD occurrence among telemarketers was significantly associated with working for more than seven months, handling more than 82 calls per day, and experiencing high-stress levels. Intra-examiner reliability for TMD diagnosis and severity was nearly perfect, as indicated by the Kappa test. Crude associations between TMD and variables such as gender, working hours, average number of calls per day, and stress level were observed. In the multivariate analysis, after simultaneous adjustment, working for over seven months (OR=2.0; 95% CI=1.1–4.0; $p=0.03$),

handling over 82 calls daily (OR=2.1; 95% CI=1.1–3.9; p=0.02), and experiencing high stress levels (OR=2.1; 95% CI=1.1–4.4; p=0.05) remained positively associated with TMD. While gender showed a positive association, it was not statistically significant.

The prevalence of TMD in this population, compared to other occupations, was notable but of low severity (TMI = 0.08±0.02) on a scale from 0 to 1, where 1 represents maximum severity. This finding may be attributed to the high turnover in telemarketing, with most workers remaining in their roles for less than a year. Comparisons with other professions—such as dental surgeons, nurses, military personnel, IT professionals, and musicians—show variations in TMD prevalence, likely due to differing occupational characteristics [20-22]. For instance, TMD prevalence was 24.7% among military personnel [23], and 69% among nurses [24], highlighting disparities related to job demands and stressors. Among musicians who use wind instruments and professional singers, they found that although the incidence is like that of the general population, the symptoms start and increase during training and performances [22,25]. These differences may be due to the inherent characteristics of each occupation.

Another contributing factor to variability in reported TMD prevalence is the lack of standardized diagnostic criteria. This study utilized the RDC/TMD protocol, which provides clear, precise parameters for data collection and diagnosis [26] and expands a taxonomy standardized worldwide [27], being translated and validated in numerous languages, including Brazilian Portuguese. Previous studies using this scale have identified occurrences of around 10% [26-29], which aligns with the results presented in this study.

Among telemarketers, the highest occurrence of TMD was observed in the muscle diagnosis group, specifically the group with myofascial pain without amplitude limitation, followed by myofascial pain with amplitude limitation, as well as other investigations [29 – 33]. This condition, classified as masticatory muscle pain (MMP), is associated with muscle overuse or ischemia caused by muscle hyperactivity [30]. This is also observed in telecare, which is characterized by repetitive movements of the TMJ for hours, without adequate breaks [4,5], which likely contributes to the high prevalence observed in this study compared to other works published involving call centers or even other occupational activities, such as dental surgeons, analysts, TV station employees, military personnel, nurses, information technology (IT) professionals and violinists [20].

Numerous studies have investigated the relationship between stress and TMD [14, 22, 33-36]. According to Dutra et al. [3], emotional stress is a systemic alteration that can influence masticatory function by increasing muscle tone. Aranha et al. [20] identified absence due to TMD according to occupation, according to professions that involved exacerbated stress conditions, such as nursing technicians. Similarly, Ton et al. [37] reported that the highest frequency of TMD among university students was observed in those with higher levels of stress and anxiety. According to Emodi et al. [38], occupation can be a triggering factor for TMD when associated with stress. Moreover, among telemarketers, the occurrence of TMD was also higher among those with a higher stress level, according to the General Health Questionnaire 12 (GHQ 12).

The activity of telephone answering involves determining stress factors such as time pressure, insufficient breaks, strong demands on memory and attention, stimuli for competition, and recording and monitoring of calls [5-12]. This is the portrait of Toyotism, which illustrates the adaptation of production to demand, increased outsourcing and working in “islands,” intensifying the pace of work, increasing pressure in the workplace, and the consequent risk of acquiring cardiovascular diseases, diseases of the musculoskeletal system, depression and stress [6,8,9,12].

The greater the demands placed on workers and the less latitude they have to control them, the greater the risk to their health [38]. Although telemarketing is typically described as a high-demand, low-control occupation [6, 8, 9,11,12, 40], this study found a higher prevalence of TMD among high-demand, high-control workers. This discrepancy may be due to the specific nature of this telemarketing company, where call durations exceeded three minutes, contrary to typical averages of 28 seconds in other companies. A higher call volume was positively associated with TMD, suggesting that shorter calls necessitate a greater number of daily interactions, increasing the risk of TMD. However, there was a positive association between the average number of calls above 82, suggesting that those with a average service time (AST) of less than three minutes make more calls and are consequently more prone to TMD. Similar results were found in a study that investigated TMD among 124 call center employees, showing statistical significance among those who made a higher number of calls[41].

The cumulative effects of prolonged telemarketing work are evident. This study observed significant associations between longer job tenure (>7 months), high call volumes (>82 per day), and elevated stress levels with TMD. While no prior studies

have explicitly linked telemarketing to TMD, the psychological burden of the profession, described since 1956 by the psychiatrist Lê Guillant [7] contributes to the emergence of occupational pathologies, many of which remain unrecognized.

A population-based study conducted in Ferrara, Italy [42] using telephone interviews rather than physical examinations, reported similar findings regarding gender and age. The investigation of TMD among non-patients and in specific occupations is an advance in knowledge; however, as this is an exploratory cross-sectional study, all the findings should be interpreted cautiously. Longitudinal studies are needed to confirm these results and better understand occupational risk factors for TMD.

Public health policies are essential to address TMD in the workplace. Preventive measures should include reducing working hours, increasing rest breaks, and eliminating average service time metrics. Replacing current performance evaluations and prioritizing adherence to prescribed scripts with problem-solving criteria may also help mitigate occupational stress and its health consequences.

CONCLUSION

This study concludes that the prevalence of TMD among telemarketers in Brazil is 40.5%, and it is significantly associated with working for more than seven months, making an average of over 82 calls per day, and experiencing a high level of stress.

Ethical Approval and Consent:

This study adhered to the guidelines of Resolution 466/2012 for research involving human subjects and received approval from the University's Research Ethics Committee (CAAE: 0603090078590). All participants provided written informed consent prior to their inclusion in the study.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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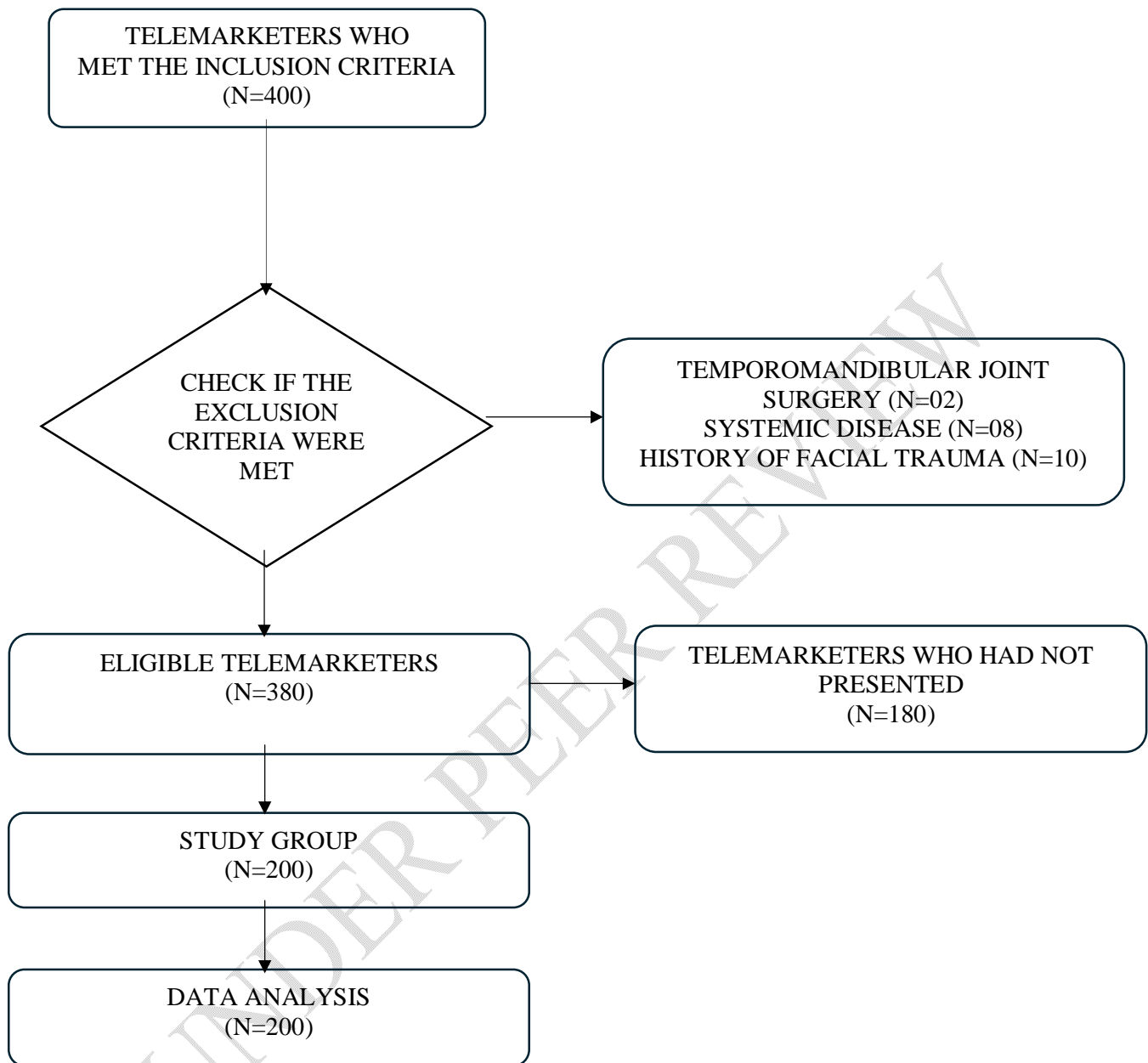


Figure 1. The flowchart of the study

Table 1. Prevalence of Temporomandibular Disorder (TMD) according to social and demographic characteristics of the studied population (n= 200)

Variable	n	TMD (81)		p - χ^2
			%	
Age (Years)				
< 24	38		39.18	0.71
≥24	43		41.75	
Sex				
Female	65		44.22	0.08
Male	16		30.19	
Level of schooling				
High School	25		32.05	0.16
Complete University Education	19		52.78	
Incomplete University Education	37		43.02	
Family income^a				
From 1 to 3 minimum wage	29		14.50	0.07
>3 e ≤ 5 minimum wage	23		11.50	
>5 e ≤ 7 minimum wage	11		05.50	
>7 e ≤ 9 minimum wage	09		04.50	
>9 minimum wage	09		04.50	
Marital Status				
Single	67		39.88	0.65
Married	13		43.33	
Separated/Divorced	01		50.00	
Ethnicity				
White	12		38.71	0.51
Mixed-ethnicity	21		35.59	
Black	46		44.23	
Yellow	02		33.33	

^aNote: Minimum wage in Salvador, Bahia, Brazil is USD 230 per month

Table 2. Prevalence of Temporomandibular Disorder (TMD) according to occupational characteristics of the studied population (n= 200)

TMD

Variable	N	(81) %	p - χ^2
Length of service			
≥ 7 months	58	51.79	0.0003
< 7 months	23	26.14	
Average number of calls per day			
≥ 81 calls per day	45	54.88	0.0006
< 81 calls per day	36	30.51	
Average service time (AST)			
≥ 3 min per call	78	40.21	0.63
< 3 min per call	03	50.00	
Relationship between symptoms and work			
Yes	41	51.25	0.01
No	40	33.33	
Stress activity			
Yes	61	44.85	0.06
No	20	31.25	
Demand			
Low	38	35.51	0.12
High	43	46.24	
Control			
Low	36	34.29	0.06
High	45	47.37	

Table 3. The severity of TMD among call center attendants according to the temporomandibular index (TMI) and their sub-indexes functional index (FI), muscular index (MI), and articular index (AI) (n=81)

Index	Descriptive Measures			
	Minimum	Maximum	Median	Mean
TMI	0.0	0.62	0.08±0.02	0.12±0.13
FI	0.0	0.83	0.08±0.52	0.17±0.23
MI	0.0	0.90	0.10±0.02	0.14±0.16
AI	0.0	0.63	0.06±0.13	0.00±0.16

Table 4. Prevalence Ratios (PR) and 95% Confidence Intervals (95% CI) for the association between TMD and the independent variables, obtained through bivariate analysis

Variable	PR	95% CI
Sex		
Male	1.0	
Female	1.2	(1.0 – 1.4)
Length of service		
< 7 months	1.0	
≥ 7 months	1.6	(1.2 – 2.0)
Average call per day		
< 81 calls per day	1.0	
≥ 81 calls per day	1.8	(1.3 – 2.5)
Stress level		
Low	1.0	
Hjgh	2.1	(1.2 – 3.6)

Table 5. Final Logistic Regression analysis model for the occurrence of TMD among call center attendants.

Model^a	Odds Ratio	95% CI^b
Length of activity		
< 7 meses	1.0	
≥ 7 meses	2.0	(1.1 – 4.0)
Average calls per day		
< 81 calls per day	1.0	
≥ 81 calls per day	2.1	(1.1 – 3.9)
Stress level		
Low	1.0	
High	2.1	(1.1 – 4.4)

^a Stepwise backward method

^b 95% Confidence Interval

*Hierarchical multiple logistic regression with level of significance $p < 0,05$; interval with 95% confidence